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ABSTRACT

The work reported in this paper is one segment of a larger project which began in 1971, a project aimed at assisting practicing school psychologists to update their knowledge and skills. Efforts were directed at getting the psychologists to update their knowledge and skills. Efforts were directed at getting the psychologists to include in their work with teachers and children recent theoretical and research developments in education and the psychology of education. This particular paper focuses on cognitive development, the most applicable of the four theoretical approaches considered. In addition, the author provides a sample assessment designed to yield qualitative information on a pupil and gives some guidelines for administering this sample assessment. (Author/VG)

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A SAMPLE ASSESSMENT OF COGNITIVE DEVELOPMENT IN THE SCHOOL-AGE CHILD

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The work reported in this paper is one segment of a much larger project which began in 1971. At that time trainers of school psychologists in California were concerned with the need to assist practicing school psychologists to update their knowledge and skills so that they might include in their work with children and teachers recent theoretical and research developments in education and the psychology of education.

With the support of the California State Department of Education, a year-long project was undertaken to review pertinent literature with the goal of identifying new assessment areas which might be of interest to psychologists in schools. At the end of this intensive literature search, four areas presented a strong theoretical and research basis for consideration: cognitive development, language development, adaptive behavior and learning proficiency as assessed by a paired-associate task.

Cognitive development clearly supplements traditional school psychological assessment practice in at least three ways. It emphasizes the quality of a child's reasoning or how a child acquires a new concept, not simply whether or not he has learned the concept. Second, this qualitative rather than quantitative emphasis provides tremendous potential for translating assessment data into classroom strategies for maximizing learning. Finally, such a developmental emphasis should encourage collaboration between the psychologist and the teacher as they focus on classroom learning.

As we documented our findings from this project and cited our recommendations for school psychologists (Lambert, Wilcox and Gleason, 1974), we confronted the dilemma of inadequate assessment models for these areas in the school setting. Numerous instruments have been devised to assess cognitive development.

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Several of these are excellent, rigorously designed tests but require approximately 10 hours to administer. Others are not so time-consuming but assess only a narrow range of cognition, generally classification tasks. Given this lack of assessment instruments appropriate for use by a school psychologist, I developed a sample assessment kit made from readily available materials which I believe can provide psychologists with useful information on this one facet of how individual pupils learn.

The sample assessment is not designed to yield a numerical score; it is quite inadequate for that purpose. It is designed to yield qualitative information on a pupil. Such an assessment is most useful if the psychologist and teacher collaborate not only on developing educational plans using such information, but also collaborate on continuing informal assessment, to document a child's developmental progress as a basis for on-going planning.

Psychologists who wish to use this material in work with mentally retarded children should examine such research as that of Inhelder (1968). There is evidence that the mentally retarded can be differentiated from normally developing children. The former progress through the same stages of cognitive development as the latter but they move through these stages more slowly, and they become fixated at an earlier level. The reasoning of the mentally retarded children shows repeated oscillations between stages, evidence of a continual lack of stability in their reasoning. Finally, it is extremely difficult to convince the mentally retarded children of errors in their reasoning. This latter characteristic is not unique to mentally retarded children but the consistency of it as a trait is remarkable.

There are some guidelines for administering this sample assessment, in addition to the usual standards of sound testing procedure. The cognitive development tasks must be administered on a one-to-one basis. It is crucial that the psychologist follow up the child's responses to clarify the pupil's reasoning.

This can be accomplished only with an individual pupil. I recommend that the tasks be either tape-recorded and later transcribed, or recorded verbatim at the time of administration. If sufficient space is allotted in the margin for interpretive notes, then the psychologist has a complete record of the task administration, the pupil's responses and the analysis of those responses. This is a legally sound procedure for protection of the pupil and the psychologist, and it also facilitates follow-up assessment when comparisons of current responses with earlier responses are desirable.

If the psychologist is working with a child of elementary school age, I suggest giving the classification and conservation tasks described below. If the pupil is junior high or high school age, administering the conservation tasks and formal operations tasks would be more appropriate.

The Sample Assessment

Classification Tasks (See Inhelder and Piaget, 1964, for a thorough, systematic presentation of the developmental progression of classification and seriation abilities in children, including anecdotal responses representative of the various developmental levels.)

Material: Set of wooden and plastic shapes varying in color and size. Four sheets of white paper.

Procedure. Place shapes randomly on the table. Say "Put together the things that are alike" or "Put the same things together." If S fails to respond, place one object on a sheet of paper and say "Put the others that are just like this one here." As S arranges the objects say "Tell me what you are doing." Some sample variations of this task include: Set out four sheets of paper and place one large plastic circle differing in color on each piece. Say "Put on these papers the things that are alike, that are the same." Place three blue wooden squares, and three large plastic squares (green, red, yellow) before S. Place one sheet of paper

before S and say "This is a paper on which only blue things can be placed. Do the small squares belong on this paper or not?" After S responds, say "Why do you think so?" Then place another paper before S and say "This paper is only for squares. Does the red shape belong here?" After S responds, say "Why do you think so?" Finally, place three blue wooden squares, two blue plastic circles, two green plastic circles before S. "Are there more blue shapes or more circles?" After S responds, ask "Why do you think so? Are all the green things circles?" After S responds, "Why do you think so?" Then ask "Are all the circles green? Why do you think so?" Next inquire "Are all the squares blue? Why? Are all the blue things square? Why?"

Analysis. Children's classification abilities develop through a series of levels, as follows: graphic representations, resemblance sorting, consistent/exhaustive sorting, multiple class membership, class inclusion, horizontal reclassification, hierarchical reclassification. The initial task above assesses graphic vs. nongraphic collections. Task 2 may establish resemblance sorting or exhaustive sorting. The third task assesses multiple class membership ability, and the fourth task provides for a demonstration of class inclusion ability. Tasks to assess horizontal reclassification and hierarchical reclassification may be found in Inhelder and Piaget (1964).

Conservation Tasks (It is recommended, before administering any conservation task, that you assess the pupil's understanding of relational terms such as "more", "less", "same", and others that you may include as you vary the tasks.)

Conservation of continuous length--Material. Two identical lengths of yarn, ribbon or string; scissors.

Procedure. Establish initial equivalence by placing lengths of yarn parallel with ends even. _____ Ask "Are these both the same length or is one longer and one shorter?" Cut the ends as necessary until S agrees on equivalence of length.

Move one length an inch ahead and ask "Now are they both the same length or is one longer and one shorter?" Then "Why do you think so?" If S states that one is different, ask which one and then reverse position of lengths and repeat questions.

Finally, re-establish initial equivalence as above, and then say "Watch what I do now." Slowly bend one into a half-circle (or S or other shape) and repeat questioning procedure above.

Analysis. If S responds that both are the same and explains satisfactorily, S is indicating conservation of continuous length with this task. If S vacillates in his judgment, S may be in transition from nonconservation to conservation. If S consistently responds that one is longer, S has not reached conservation of continuous length.

Conservation of liquid quantity--Material. Two identical clear jars; one taller, narrower clear jar; one shorter, wider clear jar; water; eye-dropper; food coloring (to increase visibility of water).

Procedure. Establish initial equivalence by filling two identical jars about two-thirds full of water. Ask "Do these two glasses contain the same amount of water or does one contain more and one less?" With eye-dropper adjust quantity as necessary until S agrees on equivalence of liquid. Then say "Watch closely what I am going to do" and pour liquid from one of the jars into the taller, narrower one and ask "Now do they both have the same amount of water or does one have more water and one less water?" Then "Why do you think so?" Finally, re-establish equivalence between the two identical jars, removing the taller, narrower one, and then say "Now watch closely." Pour the liquid from one of the containers into the shorter, wider container and repeat the questions above.

Analysis. Once equivalence is established, if S responds that all jars have the same amount of water and explains his reasoning, this indicates that S

is able to conserve liquid quantity on this task. If S vacillates in his judgments, S is probably in transition. If S consistently replies that one jar has more, this indicates that S is a nonconserver of liquid quantity.

Conservation of discontinuous length--Material. Two identical lengths of yarn, ribbon or string; scissors.

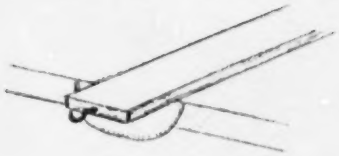
Procedure. Establish initial equivalence by following same procedure as outlined for conservation of continuous length. Then say "Watch closely what I do." Cut one length into four equal lengths and arrange into a zig-zag below continucus length. Say "One rabbit was hopping along this road" (demonstrating by hopping your finger along the straight road) "and his friend was hopping along this one. Which rabbit has the longer road or do they both have to hop the same distance?" Then "How do you know that?" Next, re-establish equivalence as above, then rearrange cut lengths into another pattern. Ask "Which one is longer or are they both the same length? Why do you think so?"

Analysis. If S responds that both are the same and explains satisfactorily, S is indicating conservation of discontinuous length with this task. If S vacillates in his judgment, S may be in transition from nonconservation to conservation. If S consistently responds that one is longer, S has not reached conservation of continuous length.

Formal Operations Tasks (See Inhelder and Piaget, 1958, for a thorough discussion.)

Oscillation of a pendulum--Material. Protractor; four lead weights (#1, #2, #3, #4); four washers; four lengths of string (12", 10", 8", 6"); four paper clips; one board with cup hook screwed to end; one strip wide packing tape. Knot one end of each string around a paper clip, turning outer loop of clip to form a hook. Knot other end of each string around a washer.

Procedure. Tape protractor to table edge. Tape board to table top, centered above protractor with cup hook end extending about one inch beyond table edge.



Randomly arrange the strings and weights on the table, alongside the board. Show S how the washers and strings can be hung from the cup hook, and the weights attached. Then say "What do you have to do to make it go faster?" As S manipulates the objects, say "Tell me what you are doing?" After S decides, ask "How can you prove it?" To explore S's recognition of the role of string, length, weight, release height and release force, if S does not mention these, ask "If you use a shorter string, will the pendulum swing faster or slower or the same?"

Analysis. If S approaches the task in a random way, showing no systematic approach to the task, this indicates that he is at the preoperational level on this task. If S manipulates the objects and observes correctly but does not develop a controlled method of investigating the variables, it indicates thinking at the concrete operations level. S may decide that weight is the critical variable, but his justification for that decision is incomplete. If S is able to conduct a controlled experiment, holding all variables constant in turn except one, it indicates that S is at the level of formal operations. In addition, S can set hypotheses and then carry out the necessary manipulations to prove or disprove these hypotheses. Expected age for attainment of ability to identify and manipulate variables and relationships involved in such problems as oscillation of a pendulum is 14-16 years.

Proportional reasoning task--Material. (Adapted from Karplus and Peterson, 1970.) Sheet white poster board with Mr. Short (a figure four #1 paperclips high) on one side and Mr. Tall (a figure eight #1 paperclips high) on the other side; 14 #1 Gem paperclips chained together; 14 #3 Gem paperclips chained together.

Procedure. Place drawing of Mr. Short before S and say "Here is a drawing of a man called Mr. Short. Let's measure Mr. Short with these big paperclips.

We'll call them biggies." Measure, holding one clip at center of Mr. Short's head and extending to his feet. Then ask "Now how many biggies high is Mr. Short?" (four biggies) "Now I have a chain of small paperclips here. I'll call them smallies. Measure Mr. Short's height in smallies. How many smallies high is he?" (five smallies) After S measures, turn posterboard over to display Mr. Tall and say "Here is Mr. Tall." Hold big clips from head to toe of Mr. Tall and say "Mr. Tall is 8 biggies high. How high do you think Mr. Tall is in smallies?" S may recheck the three measures already made. Paper and pencil may be provided. When S responds, say "How did you decide on that number? Explain it to me." Finally, let S measure Mr. Tall with smallies to check his answer.

Analysis. If S guesses, otherwise indicates an inability to use the data for reasoning, or is completely unable to approach the task, this indicates that S is at the preoperational level on this task. If S's explanation indicates the use of proportionality but he estimates the length ratio instead of computing it from the information provided, and questioning does not readily alter his strategy, S is probably at the concrete operations level on this task. If S uses proportionality and clearly demonstrates how he derived it from the data provided on Mr. Tall and Mr. Short, S is at the formal operations level on this task. Expected age for attainment of proportional reasoning is 16-18 years.

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